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ABSTRACT

To project school enrollments and the associated need for teachers and other school personnel in Colorado, a research study utilized historical data from 1960-1978 to serve as the basis for the projections. Population, live birth, and school enrollment data were analyzed, using programs from the Statistical Package for the Social Sciences. The study projects that the population of Colorado can be expected to grow, on the average, between 1.4 percent and about 2.0 percent annually and that total school enrollment will generally increase over the period 1980-2000. The tables show the population, live births, live birth rate, and total school enrollment for the years 1960 through 1978 along with the percentage change in each from the previous year. These same categories are projected through the year 2000 with low and high estimates along with nonteaching certified personnel and classroom teachers needed for the period. Other tables show the grade level enrollment by year and projected grade level enrollment. The accompanying technical report describes the study, lists its limitations, and presents the methodology and the results of the study along with a discussion and a summary. (MLF)

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PROJECTED
COLORADO PUBLIC SCHOOL ENROLLMENTS
TO THE YEAR 2000

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for

The Board of Regents,

University of Colorado

January, 1980

EA 015 330
Part 1.

Conclusions from This Report

1. The pool of 18 year olds in grade 12 will gradually increase over the next twenty years in the range of 3,000 to 10,000 indicating gradually increasing enrollments in Colorado institutions of higher education.

2. Total school enrollment in Colorado will generally increase over the period 1980-2000 with an average annual percent increase of about 1.7 percent. This growth rate will be slightly less than the growth rate for population over the same period.

3. During the mid-1980's there will be a period of two to three years of little or no growth in total school enrollment in Colorado.

4. In Colorado, grade level enrollments, number of certificated personnel, and number of teachers will closely parallel the trend in total school enrollment over the period 1980-2000.

5. It is likely that the live birth rate will not decrease significantly below 15 births per 1000 population per year. Given this probability, actual live births over the next twenty years should be significantly greater than that projected in this study.

6. The result of this projected increase in live births would be an increase in school enrollments in excess of those projected in this study.

Background

Projection of future trends in modern society is a frequent exercise. Economists project growth or decline in commerce and industry, politicians project future needs of society, retailers project future markets for their goods. These projections are needed to plan for the allocation of resources. In a similar way, it is quite important to project educational enrollments to help the State of Colorado, communities and institutions of higher education foresee educational needs. The education of our children is one of the most important investments society makes in its own future.

With these points in mind and at the suggestion of Regents David Sunderland and Fred Betz, a research study to project school enrollments and the associated need for teachers and other school personnel in the State of Colorado was undertaken[1]. These projections for Colorado were done for the years 1980 through 2000. The historical data from 1960-1978 (See Table 1) which served as the basis for the projections contained in this study were obtained from the following sources:

1. Population data:

   Bureau of Business Research, School of Business, University of Colorado

   Department of Local Affairs, Division of Planning, State of Colorado

   Department of Health, State of Colorado

2. Live birth data:

   Department of Health, State of Colorado

3. School enrollment data:

   Colorado Department of Education

   Colorado State Library

The analyses of data in this study was completed at the University of Colorado Computing Center using approximately six researcher written programs of about 4000 lines and twenty-seven library programs from the Statistical Package for the Social Sciences. The method used for projection in this study was the most accurate, when checked with 1978 data, of five methods tried.

The method selected resulted in projected 1978 enrollment of 563,519 whereas the actual enrollment for 1978 was 558,285, a projection error of only nine-tenths of one percent over actual enrollment.

Results

The population projections given in Table 2 were obtained from the Colorado Department of Local Affairs and are given at two levels, low and high. These levels represent an approximate fifty percent confidence internal for the expected population. This means that there is a 50/50 chance that the actual population will fall between the high and the low figures. The percent change from year to year is also shown. One may observe that the population of Colorado can be expected to grow on the average between 1.4 percent and about 2.0 percent annually. This growth rate is slightly less than that projected for the Denver metropolitan area as given in a report by the U.S. Department of Housing and Urban Development[2]. This report projects a growth rate for the Denver metropolitan area of from 1.8 percent to 2.3 percent during the same period. The projected growth rate for the State is greater than that projected for the United States at large as given in a report by the U.S. Census Bureau[3]. This report projects that the population of the country as a whole will grow at a rate of about one percent annually

during the period 1980-2000. The greater growth for Colorado is consistent with the fact that Colorado is felt to be a more desirable place to live than some of the other 49 states.

Projected live births for Colorado were computed from a formula relating population to live births over the past 28 years. This formula was applied to the projected population data to arrive at projected live births. These are given in Table 2 as a low and a high figure and, as in the case with projected population, can be considered to be in the fifty percent confidence interval. The percent change from year to year is given adjacent to the projected live births. From this column it is seen that there is an expected increase in live births over 1980-2000 of from .2 percent to .4 percent annually.

Projected live birth rate was computed from the projected population and projected live births. It was computed using the formula

$$\text{live birth rate} = \frac{\text{live births}}{\text{population}} \times 1000$$

This live birth rate is the expected number of live births per 1000 population. Considering the column adjacent to the projected live birth rate, the percent

change from the previous year, the projected trend in live births will result in a constantly decreasing live birth rate. There is good reason to believe that this trend will not be the case, however, as indicated in a report from the National Institute of Education[4]. This report indicates that live births are expected to rise. Secondly, in the period 1960-1978 (Table 1) it may be observed that the live birth rate in Colorado was never below 15 live births per 1000 population. Because of these factors, the projected live births and resulting school enrollment projections discussed below should be considered quite conservative.

Total school enrollments were projected from population and live births. Once again, these are given in low and high projections paralleling that for population and can be considered representing a fifty percent confidence interval. The percent change from year to year in this figure is given three columns from the right. In Table 2, one can see from the percent change column that early in the 1980's increases in enrollment of about one percent to three percent annually are expected. Then there will be a two to three year period of very little increase or decrease in enrollments. About 1988 the

growth in enrollment will pick up again at the rate of about 1.2 percent to two percent annually. It should be noticed that growth in enrollment over the period will be less than that projected for population. It should also be recognized that the growth in enrollment for Colorado for the period is slightly less than that projected for the Denver metropolitan area[5] but slightly more than that of the nation as a whole[6].

In an article by the Knight-Ridder Newsservice in July, 1979[7], Katz indicated that a slight "baby boom" was experienced about 1977 (see Table 1) and that this slight bulge in that age group would be in schools about 1982 and continue through the grades. This is not inconsistant with the projected school enrollments in Table 2.

The last two columns of figures in Table 2 project staff needs to support the school enrollments given in the table. These are given in low and high figures corresponding to approximately a 50 percent confidence interval. The figures for the number of non-teacher certified personnel needed to support the projected total school enrollment was determined by multiplying each

projected total school enrollment by a factor equal to the ratio of students to non-teacher certified personnel in Colorado in 1978 which was very close to 101 to 1. The number of teachers needed to support the projected enrollment was obtained by a similar procedure except that the ratio of students to teachers in Colorado for 1978 was 19 to 1. The percent change from year to year for both these columns of numbers is the same as that for total school enrollment.

The data in these two columns are important because the number of teachers needed for the year 2000 represents an increased demand over that in 1978 of between 7700 and 14,400 teachers and between 1,460 and 2,700 non-teacher certified personnel. This increased demand over the next twenty years coupled with the usual vacancies ("turnover") of about 2000 positions[8] accounts for a significant demand for the foreseeable future. Adding to these figures are the following facts:

(a) for the recent past about 44 percent of the teaching positions in the State have been filled by hiring persons from outside Colorado[9];

(b) only 60-75 percent of teacher education graduates seriously seek a teaching position[10];

(c) the number of teacher graduates will continue to decrease in the near future; and

(d) that about 15 percent of Colorado education graduates obtain positions in other states,[11]

indicates that a slight increase in resources allocated to educating school personnel may be needed over the next few years.

Table 3 presents actual enrollment data by grade levels for Colorado for the years 1961-1978. Table 4 translates the enrollment projections given in Table 2 into grade level projections. The significant pattern in projected grade level enrollments is a slight plateau of enrollment growth in the mid-1980's which parallels the plateau projected for total school enrollment. An important aspect of the grade level projections is the projected grade twelve enrollments. The persons in grade twelve in the future will be the primary pool of students for the higher education institutions in the State. Thus it is important to note the increases in enrollment in grade twelve over the period; the increase in actual numbers is in the range of 3,000 to 10,000 students at fifty percent confidence interval.

References

1. Minutes of the Regents of the University of Colorado, December, 1978
2. U.S. Department of Housing and Urban Development, Denver Metropolitan Area Environmental Impact Statement, Volume I, Introduction, Summary and Conclusions, p. 21, October, 1978
3. U.S. Bureau of the Census, Current Population Reports, Series P-25, No. 601, Tables E, 6 and 8
4. National Institute of Education, Declining Enrollments; The Challenge of the Coming Decade, p. 23, March, 1978
5. U.S. Department of Housing and Urban Development, Denver Metropolitan Area Environmental Impact Statement, Volume II, Environmental Information Base, p. 58, October, 1978
6. Same as reference number 4, p. 32.
7. Katz, Dolly, "Post War Baby Boom is Cresting Again", Knight-Ridder Newservice, Boulder Camera, July 2, 1979, p. 8
8. Colorado Commission on Higher Education, A Review of Teacher Education Programs in Colorado, p. 62
9. ibid.
10. op. cit., p. 24
11. op. cit., p. 7

TABLE 1. POPULATION, LIVE BIRTHS, LIVE BIRTH RATE AND TOTAL SCHOOL ENROLLMENT FOR THE YEARS 1960 THROUGH 1978 ALONG WITH THE PERCENT CHANGE IN EACH FROM THE PREVIOUS YEAR.

YEAR	POPULATION	PERCENT CHANGE	LIVE BIRTHS	PERCENT CHANGE	LIVE BIRTH RATE	PERCENT CHANGE	SCHOOL ENROLLMENT	PERCENT CHANGE	YEAR
1960	1753947.		42905.		24.5		392343.		1960
1961	1840000.	4.906	44648.	4.062	24.3	-.804	415282.	5.847	1961
1962	1900000.	3.261	43594.	-2.361	22.9	-5.444	438312.	5.546	1962
1963	1940000.	2.105	42179.	-3.246	21.7	-5.241	459820.	4.907	1963
1964	1970000.	1.546	40537.	-3.893	20.6	-5.356	475928.	3.503	1964
1965	1990000.	1.015	36851.	-9.093	18.5	-10.007	486784.	2.281	1965
1966	2010000.	1.005	34899.	-5.297	17.4	-6.239	498388.	2.384	1966
1967	2050000.	1.990	35166.	.765	17.2	-1.201	510092.	2.348	1967
1968	2120000.	3.415	36842.	4.766	17.4	1.307	524347.	2.795	1968
1969	2170000.	2.359	39189.	6.370	18.1	3.920	538175.	2.637	1969
1970	2209528.	1.822	41480.	5.846	18.8	3.952	550060.	2.208	1970
1971	2283037.	3.340	40360.	-2.700	17.7	-5.845	564502.	2.626	1971
1972	2364000.	3.533	38585.	-4.399	16.3	-7.660	574248.	1.726	1972
1973	2468000.	4.399	38507.	-.202	15.6	-4.408	573154.	-.191	1973
1974	2515000.	1.904	39036.	1.374	15.5	-.521	568060.	-.889	1974
1975	2541000.	1.034	40143.	2.849	15.8	1.796	568851.	.139	1975
1976	2575000.	1.338	40978.	2.067	15.9	.720	567087.	-.310	1976
1977	2619000.	1.709	43056.	5.071	16.4	3.306	561807.	-.931	1977
1978	2664000.	1.718	44063.	2.339	16.5	.610	558035.	-.627	1978

12

14

13

TABLE 2. PROJECTIONS FOR POPULATION, LIVE BIRTHS, RESULTANT LIVE BIRTH RATE, TOTAL SCHOOL ENROLLMENT, NON-TEACHING CERTIFIED PERSONNEL AND CLASSROOM TEACHERS NEEDED FOR THE YEARS 1980-1985, 1995 AND 2000, ALONG WITH THE PERCENT CHANGE IN EACH FROM THE PREVIOUS YEAR.

YEAR •	•	POPULATION	PERCENT CHANGE	LIVE BIRTHS	PERCENT CHANGE	L.B. RATE	PERCENT CHANGE	SCHOOL ENR.	NON TEACHER CERT. PERS.	TEACHERS	PERCENT CHANGE	• YEAR
1980	LOW	2823100.		41039.		15.6		546951.	5410.	25886.		LOW 1980
	HIGH	2895400.		41776.		14.4		609601.	6030.	32172.		HIGH
1981	LOW	2855200.	1.22	41123.	.20	15.5	-1.01	551600.	5456.	29111.	.85	LOW 1981
	HIGH	2870800.	2.24	41946.	.41	14.1	-1.80	621596.	6148.	32805.	1.97	HIGH
1982	LOW	2887700.	1.22	41207.	.21	15.3	-1.01	560061.	5599.	29874.	2.62	LOW 1982
	HIGH	3035700.	2.23	42119.	.41	13.9	-1.77	643514.	6365.	33962.	3.53	HIGH
1983	LOW	2721900.	1.26	41295.	.21	15.2	-1.03	561159.	5748.	30671.	2.67	LOW 1983
	HIGH	2103700.	2.21	42093.	.42	13.6	-1.75	665980.	6587.	35148.	3.49	HIGH
1984	LOW	2754700.	1.22	41382.	.21	15.0	-1.00	592616.	5882.	31276.	1.97	LOW 1984
	HIGH	3168800.	1.77	42437.	.34	13.4	-1.41	679764.	6724.	35875.	2.07	HIGH
1985	LOW	2787700.	1.20	41469.	.21	14.9	-.98	595851.	5894.	31447.	.55	LOW 1985
	HIGH	3215400.	1.80	42585.	.35	13.2	-1.42	696357.	6789.	36223.	.97	HIGH
1986	LOW	2828800.	1.39	41570.	.24	14.7	-1.13	594420.	5879.	31371.	-.24	LOW 1986
	HIGH	3277000.	1.93	42747.	.38	13.0	-1.52	690823.	6833.	36459.	.65	HIGH
1987	LOW	2867000.	1.43	41676.	.25	14.5	-1.16	593247.	5868.	31309.	-.20	LOW 1987
	HIGH	3341900.	1.96	42915.	.39	12.8	-1.54	692656.	6851.	36556.	.27	HIGH
1988	LOW	2907700.	1.42	41782.	.25	14.4	-1.15	601253.	5947.	31732.	1.35	LOW 1988
	HIGH	3408800.	1.94	43085.	.39	12.6	-1.52	701167.	6935.	37005.	1.23	HIGH
1989	LOW	2951000.	1.49	41895.	.27	14.2	-1.20	612529.	6059.	32327.	1.88	LOW 1989
	HIGH	3472200.	1.92	43255.	.40	12.5	-1.49	714424.	7066.	37704.	1.89	HIGH
1990	LOW	2997800.	1.59	42017.	.29	14.0	-1.28	618508.	6118.	32642.	.98	LOW 1990
	HIGH	3535600.	1.82	43421.	.38	12.3	-1.42	732723.	7247.	38670.	2.56	HIGH
1995	LOW	3242100.	8.15	42655.	1.52	13.2	-6.13	653714.	6466.	34500.	5.69	LOW 1995
	HIGH	3880100.	9.75	44320.	2.07	11.4	-8.99	774021.	7656.	40850.	5.64	HIGH
2000	LOW	3500200.	7.96	43329.	1.56	12.4	-5.91	703103.	6954.	37107.	7.56	LOW 2000
	HIGH	4224800.	8.88	45219.	2.03	10.7	-6.29	829724.	8207.	43789.	7.20	HIGH

• THE LOW-HIGH PROJECTIONS REPRESENT A FIFTY PERCENT CONFIDENCE INTERVAL.
POPULATION FIGURES ARE FROM THE COLORADO DEPARTMENT OF LOCAL AFFAIRS.

TABLE 3. GRADE LEVEL ENROLLMENT BY YEAR

YEAR	K	1	2	3	4	5	6	7	8	9	10	11	12	OTHER	TOTAL
61	29745.	40002.	38066.	36475.	35249.	34143.	32398.	32058.	32077.	32828.	26945.	21100.	19083.	4853.	415282.
62	33037.	41454.	39889.	38076.	36776.	35345.	34345.	32997.	32586.	32723.	32309.	25500.	19330.	4965.	436312.
63	34997.	42832.	39915.	38571.	38048.	36599.	35815.	34924.	32903.	33342.	32464.	30572.	23544.	5694.	459820.
64	35873.	43082.	41003.	39548.	38059.	37992.	36723.	36296.	34832.	33492.	33147.	30929.	28745.	5921.	475928.
65	36961.	42184.	40727.	40010.	38288.	38269.	38095.	37342.	36226.	35448.	33108.	31046.	29288.	7192.	486784.
66	37517.	44506.	41545.	40542.	40248.	39416.	39481.	38358.	37314.	36845.	35800.	31832.	29358.	5846.	498368.
67	37646.	40439.	41886.	40509.	39985.	39007.	38793.	38372.	38708.	38021.	36736.	33694.	29842.	11674.	510092.
68	37473.	42644.	41748.	41539.	40628.	40232.	40154.	40714.	39037.	38473.	38051.	35307.	31993.	14553.	524347.
69	38244.	42092.	43051.	43327.	43572.	42617.	41886.	42306.	41198.	40784.	40278.	36551.	32946.	8423.	538175.
70	38174.	41297.	40771.	41997.	42475.	42785.	41962.	43335.	42872.	42255.	41039.	38456.	34570.	18072.	550060.
71	35323.	38380.	40244.	40556.	42066.	42516.	43125.	45582.	44422.	44426.	43120.	39992.	35916.	28534.	564502.
72	36779.	37444.	39263.	41381.	42613.	44045.	44779.	47709.	46180.	45580.	45299.	41390.	36519.	25167.	574248.
73	37943.	37204.	38464.	39037.	41565.	42548.	43991.	47031.	47512.	47035.	45699.	42197.	37242.	20897.	573154.
74	38838.	38570.	37533.	37810.	40101.	42531.	43971.	47071.	47420.	47889.	46794.	42660.	38162.	18840.	568060.
75	40785.	41149.	38812.	38232.	38038.	40896.	43838.	46064.	46547.	47590.	46056.	44459.	39508.	15279.	568651.
76	40872.	43507.	41256.	39203.	38065.	39005.	42012.	45153.	46057.	48035.	46365.	45433.	40345.	8776.	567087.
77	37152.	43370.	43169.	41258.	39478.	38033.	39242.	42496.	44993.	46902.	46556.	45793.	41596.	8436.	561807.
78	35936.	40277.	43300.	43787.	41826.	40393.	39826.	40121.	43130.	46516.	47125.	44997.	40931.	10018.	559285.
MEAN	36861.	41415.	40433.	40092.	39964.	39915.	39951.	41123.	40816.	41066.	40162.	36807.	32729.	12730.	524066.

(-0 ENTRY MEANS THAT THE DATA WERE NOT AVAILABLE.)
(MEANS ARE COMPUTED FROM THE NON-ZERO ENTRIES ONLY.)

TABLE 4. PROJECTED GRADE LEVEL ENROLLMENTS COMPUTED BY MULTIPLYING THE PROJECTED TOTAL SCHOOL ENROLLMENT FROM TABLE 2 BY THE MEAN ENROLLMENT IN EACH GRADE AS A PERCENT OF TOTAL SCHOOL ENROLLMENT FROM TABLE 3.

YEAR		GRADE LEVEL K	1	2	3	4	5	6	7	8	9	10	11	12	OTHER	TOTAL
1980	LOW	38031.	43715.	42581.	42150.	41945.	41808.	41747.	42039.	42467.	42734.	41652.	39062.	33791.	12861.	546981.
	HIGH	43056.	48722.	47459.	46978.	46749.	46596.	46529.	47748.	47322.	47595.	46423.	42422.	37661.	14334.	609001.
1981	LOW	38959.	44035.	42943.	42508.	42301.	42163.	42102.	42213.	42828.	43187.	42006.	38386.	34076.	12970.	551600.
	HIGH	43803.	49381.	48382.	47902.	47679.	47513.	47444.	48085.	48263.	48532.	47336.	43257.	38402.	14616.	621596.
1982	LOW	39981.	45042.	44089.	43623.	43410.	43268.	43205.	44036.	43951.	44160.	43107.	39392.	34971.	13310.	566061.
	HIGH	45451.	51432.	50099.	49591.	49350.	49189.	49117.	50402.	49905.	50243.	49005.	44782.	39756.	15132.	643514.
1983	LOW	41047.	46443.	45244.	44765.	44538.	44402.	44358.	45018.	45123.	45375.	44257.	40443.	35904.	13665.	581159.
	HIGH	47038.	53123.	51848.	51323.	51073.	50906.	50832.	52161.	51709.	51997.	50716.	46345.	41144.	15580.	665980.
1984	LOW	41656.	47084.	46136.	45689.	45447.	45298.	45232.	46415.	46013.	46069.	45129.	41240.	36612.	13935.	592616.
	HIGH	48012.	54330.	52921.	52385.	52120.	51959.	51884.	53241.	52779.	53073.	51786.	47305.	41996.	15984.	679764.
1985	LOW	42085.	47623.	46338.	45919.	45695.	45545.	45479.	46669.	46264.	46522.	45375.	41485.	36812.	14011.	598851.
	HIGH	48477.	54867.	53404.	52893.	52635.	52463.	52387.	53757.	53291.	53588.	52268.	47783.	42403.	16139.	686057.
1986	LOW	41994.	47509.	46277.	45809.	45585.	45436.	45370.	46557.	46153.	46410.	45266.	41385.	36723.	13977.	594420.
	HIGH	48393.	55213.	53782.	53237.	52978.	52808.	52728.	54107.	53638.	53937.	52608.	48074.	42679.	16244.	690823.
1987	LOW	41901.	47415.	46185.	45718.	45485.	45346.	45280.	46485.	46082.	46318.	45177.	41304.	36651.	13950.	593247.
	HIGH	48922.	55300.	53835.	53279.	53119.	52945.	52868.	54251.	53780.	54080.	52747.	48202.	42792.	16287.	692656.
1988	LOW	42465.	48035.	46809.	46335.	46109.	45958.	45891.	47092.	46683.	46943.	45787.	41841.	37145.	14138.	601253.
	HIGH	49523.	56040.	54587.	54034.	53771.	53595.	53516.	54917.	54441.	54744.	53395.	48794.	43318.	16487.	701167.
1989	LOW	42883.	48503.	47285.	47204.	46974.	46820.	46752.	47975.	47559.	47824.	46645.	42635.	37842.	14403.	617529.
	HIGH	50460.	57100.	55619.	55056.	54788.	54609.	54529.	55956.	55470.	55779.	54405.	49717.	44137.	16799.	714424.
1990	LOW	43885.	49634.	48152.	47684.	47422.	47277.	47208.	48443.	48023.	48291.	47101.	43042.	38211.	14544.	618508.
	HIGH	51752.	58582.	57044.	56485.	56181.	56008.	55926.	57389.	56891.	57208.	55799.	50990.	45268.	17229.	732723.
1995	LOW	48172.	52248.	50893.	50377.	50122.	49988.	49926.	51201.	50757.	51039.	49782.	45492.	40386.	15372.	653714.
	HIGH	54689.	61083.	60259.	59649.	59359.	59164.	59078.	60624.	60098.	60433.	58943.	53864.	47819.	18200.	774021.
2000	LOW	49660.	56195.	54738.	54164.	53820.	53743.	53665.	55069.	54591.	54895.	53543.	48929.	43438.	16533.	703103.
	HIGH	56803.	63315.	64596.	63941.	63630.	63422.	63330.	64996.	64423.	64782.	63185.	57740.	51260.	19510.	829724.

Note

Readers inclined to the intricate details of this study are directed to a complete technical report of the study and its results available from the Center for Educational Leadership Services, School of Education, University of Colorado, Boulder, Colorado 80309. Inquiries should be directed to that office.

A study projecting public school enrollments for each of the counties in Colorado is in process as this report is written. A report of this expanded study will be available in the near future.

Projected Colorado School Enrollments to the Year 2000

Technical Report

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For

The Board of Regents
University of Colorado

August 1980

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Part 2.

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I. Introduction

To plan appropriately for facilities, personnel and resources needed for the education of school age children it is important to project future enrollments. Many techniques may be used to accomplish this task--techniques that vary in sophistication from pure guesses to very complex statistical procedures involving many variables.

The purpose of this study was to project school enrollments for each grade and for all grades combined in the state of Colorado for each of the years 1980 through 2000. The bases for the projection were population, live births, school enrollments, and grade level enrollments, for the years 1950 through 1978, and projected population figures for the years 1980 through 2000.

Definitions

School enrollments: enrollment in public schools as of October 1 of the school year.

Grade level enrollments: enrollment in the grades of the public schools as of October 1 of the school year.

Teachers: classroom teachers in the public schools

Certified personnel: public school personnel who are certified through the Colorado Department of Education.

Limitations

This study considered only enrollments in the public schools of Colorado. Information from the Colorado Department of Education (CDE)

indicates that public school enrollment in Colorado is approximately 90 percent of enrollment in all schools (both public and private).[1] On a national basis for 1980 public school enrollments are expected to be 89.2 percent of enrollment in all schools (public and private) in grades K-12. Through 1986 enrollments in public schools are projected to decrease to about 87 percent of enrollment in all schools.[2] Thus readers interested in public and private school enrollments should make appropriate adjustments in the figures contained in this report.

Enrollments as given in this study are for October 1 of the school year. This figure is different from closing day membership, average daily membership, average daily attendance and average daily attendance entitlement, terms which are frequently used when speaking of school enrollment.

This study deals in part with certified school personnel and teacher demand as a by-product of the main purpose of the study. It does not, however, deal with the supply of persons in these fields either from within the state or from sources outside Colorado.

The study does not build in corrections for extraordinary factors which may inhibit or enhance population and/or school growth. At least one such factor could have profound effect on some communities within Colorado and Colorado as a whole. This factor is the growth of the energy industry in Colorado over the next twenty years.

The remainder of this report will present the methodology of the study, the procedures used for analyzing the data and making the projections, present the results of the study along with a discussion, and finally summarize these results.

II. Methodology

The research undertaken in this study can be described as demographic correlational research. The dependent variables were total school and grade level enrollments in the public schools. The independent variables used were population and live births.

Data Collection

Historical data on population and live births, for the years 1950-1978, were collected from records kept by the Bureau of Business Research, School of Business, University of Colorado Boulder, The Colorado Department of Local Affairs Division of Planning, and the Colorado Department of Health.[3] These data are shown in Table 1. It should be pointed out that in Table 1, population figures for the years 1960 and 1970 are a result of the census in these years. Figures for other years are estimates based on procedures outlined in the sources of the data. Since population estimates for the years 1951-1959 were unavailable, those years are not reported. The birth rate reported in Table 1 was calculated by the formula:

$$\text{birth rate} = \frac{\text{Live births} \times 1000}{\text{population}}$$

For this reason, the birth rate is the number of live births per 1000 population.

Grade level and total school enrollment data were obtained from publications of the Colorado Department of Education.[4] These data are

shown in Table 2, however, since no grade level enrollment data are available for the years 1951 through 1958, only the years 1960 through 1978 appear.

These data (population, live births, grade level enrollment, and total school enrollment) were recorded for each of the years 1950 through 1978 and transferred to computer cards for analyses.

The last data obtained were projected population for each of the years 1980-2000. These data were obtained from the Colorado Department of Local Affairs, Division of Planning,[5] and are shown in column one of Table 6. These data were also coded and keypunched on computer cards for analysis.

Analysis

The data in the previous section were submitted to several different analyses to arrive at a satisfactory projection procedure. The method of multiple linear regression within the Statistical Package for the Social Sciences[6] was ultimately chosen for the primary statistical analyses.

For projecting live births multiple linear regression was applied to the population and live birth data for the years 1950-1978. The number of live births was used as the dependent variable and population was used as the independent variable. The equation resulting from this procedure is given in Appendix A. This equation was then applied to the projected population figures from the Colorado Department of Local Affairs Division of Planning to arrive at projected live births for each of the years 1980-2000. These projected live births are shown in Table 6, and along with the projected population were used to compute the projected live birth rate according to the formula given above. These projected live birth rates are also shown in Table 6.

To obtain projected total school enrollment a projected total school enrollment was obtained by summing thirteen separate equations, one equation for each grade level from kindergarten through grade twelve. Each of these equations related enrollment in that grade with population during the year of enrollment, population during the year of birth, and live births during the year of birth. The sum of these equations is an equation relating enrollment in a given year to population that year, and population and live births for each year from 5 to 17 years previous. This procedure accounts for population variations over the previous 17 years due to in-migration, out-migration, and births. It also accounts for patterns of enrollment change due to greater or lesser percentages of a given age person attending school, increases or decreases in the "dropout" rate, etc.

The equation resulting from this procedure is given in Appendix A. This equation was then applied to the population and live birth data given in Tables 1 and 6 to obtain projected school enrollment in grades K-12. The result was then incremented by an amount reflecting enrollment in the "other" grade catagory. This amount was determined by computing the difference between the sum of the mean grade enrollments as a percent of total school enrollment for grades K-12 (Table 3) and 100. This number accounts for enrollment in non-graded, special education and other school programs. The accuracy of this procedure for projecting total school enrollments was checked by using it to project total school enrollment for 1978 (projected to be 563519) and comparing the result to actual 1978 total school enrollment (558285). The comparison indicated an over-estimate of nine-tenths of one percent.

Applying this procedure for the years 1980-2000 gave the total school enrollment projections given in Table 7. Individual grade level enrollments were then obtained by multiplying the projected total school enrollments by the decimal equivalent of the mean grade level enrollment as a percent of total school enrollment given at the bottom of Table 3. The resulting projected grade level projections are given in Table 8. (Equations for this procedures are given in Appendix A.)

It is appropriate to ask why the individual grade level projections were not obtained from the equations relating grade level enrollments with population and live births cited above. This procedure was one of the projection procedures tested in the study. It was not used because, due to the nature of the equations, the grade level projections obtained from its use resulted in numbers which in isolation seemed illogical. For example the high projected enrollment in grade three for 1995 was 51046 and for 2000 was 46968. Thus projecting a decrease in grade three enrollment of 4000 from 1995 to 2000 when in the same time period there is projected to be a population increase of 344000 persons. This did not seem to be a reasonable result. Thus, it was felt that even though using mean grade level enrollments as a percent of total school enrollment as the basis for grade level projections would initially result in an underestimate of grade level enrollments in the upper grades and an overestimate in the lower grades, it would be preferable over the long term to using the individual grade level equations as the basis.

The projected number of certified personnel needed to support the projected total school enrollment was computed by dividing the projected

total school enrollment by a ratio equal to the ratio of students to certified personnel in Colorado in 1978 (558285 to 34986).[1]

The projected number of teachers needed to support the projected grade level enrollments was computed by dividing the projected grade level enrollments by a ratio equal to the ratio of students to teachers in Colorado in 1978 (558285 to 29464).[5]

Methodological Assumptions

Due to the procedures used in this study several assumptions have been made:

1. No attempt was made to validate the projections of population made by the Colorado Department of Local Affairs Division of Planning; it is therefore assumed that these projections of population are reasonable and valid.
2. In using multiple regression analysis and by using the results of this analysis as the base of projections, it is assumed that underlying influences of the variables chosen which were established over the period 1950 through 1978 will continue for some time in the future.
3. In using the mean grade level enrollments as a percent of the mean total school enrollment as a base for grade level projections it is assumed that the distribution of students across grade levels will continue as it has in the past. This assumption results in an initial underestimate of enrollment in grades 9-12. Since 1960 enrollment in these grades as a percent of total school enrollment has been increasing the mean will underestimate recent enrollment trends in these grades. It will also initially overestimate enrollment in grades K-8, because the mean is greater than the actual numbers for the last few years.

III. Results

A. Population, Live Births and Live Birth Rate 1960-1978

Table 1 presents historical data on population, live births and live birth rate in Colorado for the years 1960-1978 along with the percent change in each from year to year. It appears that there is a somewhat cyclic increase and decrease in the growth rate of the population of Colorado over the period. The cycle is a period of about 13 years, with a maximum growth of 4.9 percent and a minimum of 1.0 percent. Each year however, had an increase in population, with an average increase of about 2.4 percent. Live births did not continuously increase over the period, however. There was a periodic increase and decrease in live births with a cycle of about nine years. Over the nineteen year period the average increase in live births was about one-third of one percent. The live birth rate also had a periodic increasing decreasing pattern over 1960-1978 with a period of about nine to ten years. Early in the interval the live birth rate was decreasing and most recently it has been increasing. The minimum birth rate was in 1974 with 15.5 live births per 1000 population.

Comparison with National Trends

The growth of population in Colorado has been considerably greater than the growth in population nationally. From year to year since 1960 to 1977 it is estimated that growth in population in the United States has decreased from an annual rate of 1.6 percent in 1960-61 to 0.8 percent in 1976-77.[7] During most of the interim years a decreasing rate of growth

was prevalent. Thus Colorado has in general a far greater growth rate than the nation as a whole and most recently it is growing in population at more than twice the national rate.

Live births on a national level decreased an average of 1.5 percent annually over the period 1960-1977. Within this time, however, there were increases and decreases as in Colorado. Nationally the greatest increase was between the years 1976-77 with +4.6 percent change and the greatest decrease was from 1970-71 with a change of -8.4 percent. The national cycle of change in live births over the time 1960-77 is about eight years[8] compared with the apparent nine year cycle in Colorado. Thus the overall pattern of live births in Colorado from 1960-78 was significantly different from the nation as a whole. Colorado experienced an overall increase, the nation experienced a decrease. Colorado was similar to the nation, however, in experiencing a periodic increase and decrease and a general increase over the most recent years.

With respect to the live birth rate, the nation experienced a decrease of slightly greater than one-third (35 percent) over the period 1960-77. This was slightly greater than the decrease for Colorado. The average annual change in live birth rate for the nation was -2.8[9] percent, again greater than Colorado figures (-1.9 percent). From 1960-73 the nation had a continuous decrease in live birth rate whereas Colorado did not. Most recently, however, both Colorado and the nation have had increasing live birth rates.

TABLE 1. POPULATION, LIVE BIRTHS, AND LIVE BIRTH RATE BY YEAR

YEAR	POPULATION	PERCENT CHANGE FROM PREVIOUS YEAR	LIVE BIRTHS	PERCENT CHANGE FROM PREVIOUS YEAR	LIVE BIRTH RATE	PERCENT CHANGE FROM PREVIOUS YEAR
60	1753947.		42905.		24.5	
61	1840000.	4.906	44648.	4.062	24.3	-.804
62	1900000.	3.261	43594.	-2.361	22.9	-5.444
63	1940000.	2.105	42179.	-3.246	21.7	-5.241
64	1970000.	1.546	40537.	-3.893	20.6	-5.356
65	1990000.	1.015	36851.	-9.093	18.5	-10.007
66	2010000.	1.005	34899.	-5.297	17.4	-6.239
67	2050000.	1.990	35166.	.765	17.2	-1.201
68	2120000.	3.415	36842.	4.766	17.4	1.307
69	2170000.	2.358	39189.	6.370	18.1	3.920
70	2209528.	1.822	41480.	5.846	18.8	3.952
71	2283337.	3.340	40360.	-2.700	17.7	-5.845
72	2364000.	3.533	38585.	-4.398	16.3	-7.660
73	2468000.	4.399	38507.	-.202	15.6	-4.408
74	2515000.	1.904	39036.	1.374	15.5	-.521
75	2541000.	1.034	40148.	2.849	15.8	1.796
76	2575000.	1.338	40978.	2.067	15.9	.720
77	2619000.	1.709	43056.	5.071	16.4	3.306
78	2664000.	1.718	44063.	2.339	16.5	.610
MEAN		2.356		.343		-1.918

(-0 ENTRY MEANS THAT THE DATA WERE NOT AVAILABLE.)
(MEANS ARE COMPUTED FROM THE NON-ZERO ENTRIES ONLY.)

B. School Enrollment 1961-1978

Table 2 presents grade level and total school enrollments in Colorado for the years 1961-1978. The data indicate that in general there were increasing enrollments at most grade levels for the greater part of the period. Most recently there have been decreases at some grade levels as well as in total school enrollment. It is notable that in 1967 there was a dramatic increase in enrollment in the "other" category. This increase was prevalent until about 1975 when it again decreased. Speculation suggests that about 1967 legislation must have passed which influenced special education or other special programs and that again in 1975 something similar took place. An additional factor in the greater figures in the "other" category for 1970-75 is the fact that some school districts had reported their school enrollment figures for grades 1-6 as ungraded classes, i.e. "other." This has a tendency to artificially inflate enrollments in the "other" category. This can also be seen by the decreases in enrollments in grades 1-6 for these years.

TABLE 2. GRADE LEVEL ENROLLMENT BY YEAR

YEAR	K	1	2	3	4	5	6	7	8	9	10	11	12	OTHER	TOTAL
61	29745.	40062.	38266.	36475.	35249.	34143.	32398.	32058.	32077.	32828.	26945.	21100.	19083.	4853.	415282.
62	33237.	41454.	38689.	38076.	36776.	35345.	34345.	32997.	32566.	32723.	32309.	25500.	19330.	4965.	438312.
63	34937.	42632.	39915.	38571.	38048.	36599.	35615.	34924.	32903.	33342.	32464.	30572.	23544.	5694.	459820.
64	35873.	43062.	41009.	39548.	38359.	37992.	36723.	36296.	34832.	33492.	33147.	30929.	28745.	5921.	475928.
65	36961.	43184.	40727.	40010.	39288.	38269.	38095.	37342.	36226.	35448.	33108.	31646.	29288.	7192.	486784.
66	37517.	44506.	41845.	40542.	40248.	39416.	38481.	38838.	37314.	36845.	35600.	31832.	29558.	5846.	498388.
67	37646.	43439.	41886.	40509.	39965.	39807.	38793.	39372.	38708.	38021.	36736.	33694.	29842.	11674.	510092.
68	37473.	42644.	41749.	41539.	40628.	40232.	40154.	40714.	39637.	39473.	38251.	35307.	31993.	14553.	524347.
69	38244.	42992.	43051.	43327.	43572.	42617.	41886.	42306.	41198.	40784.	40278.	36551.	32946.	8423.	538175.
70	38174.	41297.	40771.	41997.	42475.	42785.	41962.	43335.	42872.	42255.	41039.	38458.	34570.	18072.	550060.
71	38323.	38680.	40244.	40556.	42066.	42516.	43125.	45582.	44422.	44426.	43120.	39992.	35916.	28534.	564502.
72	38779.	37444.	39263.	41381.	42613.	44045.	44779.	47709.	46280.	45580.	45299.	41390.	36519.	25167.	574248.
73	37943.	37204.	36464.	39037.	41565.	42548.	43981.	47831.	47512.	47035.	45698.	42197.	37242.	26897.	573154.
74	38638.	38570.	37583.	37610.	40101.	42531.	43971.	47071.	47420.	47889.	46794.	42680.	38162.	18840.	568060.
75	40735.	41149.	38612.	38232.	38038.	40896.	43636.	46064.	46547.	47590.	48056.	44459.	39508.	15279.	568851.
76	40872.	43507.	41256.	39203.	39065.	39005.	42012.	45153.	46057.	48035.	48365.	45433.	40345.	8779.	567087.
77	37152.	43370.	43169.	41258.	39478.	39333.	39242.	42499.	44993.	46902.	48586.	45793.	41596.	8436.	561807.
78	35936.	40277.	43300.	43787.	41826.	40393.	39926.	40121.	43130.	46518.	47125.	44997.	40931.	10018.	558285.
MEAN	38361.	41415.	40433.	40092.	39964.	39915.	39951.	41123.	40816.	41066.	40162.	36807.	32729.	12730.	524066.

(-0 ENTRY MEANS THAT THE DATA WERE NOT AVAILABLE.)
(MEANS ARE COMPUTED FROM THE NON-ZERO ENTRIES ONLY.)

Comparison with National Figures

Table 2a. gives comparative figures on public school enrollment as a percent of population for Colorado and the nation over the period 1961-77.

Table 2a. Public school enrollment as a percent of population for Colorado and the United States for the years 1961-77.

Year	Colorado	U.S.	Year	Colorado	U.S.
1961	22.57	20.47	1970	24.89	22.53
1962	23.07	20.85	1971	24.72	22.35
1963	23.07	21.30	1972	24.29	21.97
1964	24.16	21.64	1973	23.22	21.65
1965	24.46	21.71	1974	22.59	21.31
1966	24.80	21.97	1975	22.63	21.02
1067	24.88	22.18	1976	22.02	20.65
1968	24.73	22.54	1977	21.45	20.19
1969	24.80	22.65			
			Mean	23.67	21.59
			S.D.	1.15	.76

On the average Colorado public school enrollment as a percent of population is two percent greater than corresponding national figures for the period 1961-77. This indicates one of two things. First Colorado public schools enroll a greater percentage of the available pool of 5-17 year olds than the nation, which leaves a lesser amount for private schools; and second Colorado population is in general younger than that of the nation as a whole. There is evidence that the latter is the case. U.S. Department of Commerce figures indicate that each of the years 1960-67 the percent of the population which was at age 5-17 for Colorado was about one percentage point greater than for the nation as a whole.[10]

Another comparison of Colorado school enrollment history can be made by comparing compound annual growth rate by grade level with similar date for the corresponding national age cohort. These data are given in Table 2b.

Table 2b. Compound annual growth rate for Colorado grade level enrollments and corresponding national age cohorts.

Grade/Age Cohort	Compound Annual Growth Rate Colorado (Grade) 1961-78	Nation (Cohort) 1960-77 [11]	Grade/Age Cohort	Compound Annual Growth Rate Colorado (Grade) 1961-78	Nation (Cohort) 1960-77 [11]
K/5	+1.21%	-1.23%	7/12	+1.33%	+0.58%
1/6	+0.03%	-0.44%	8/13	+1.76%	+0.50%
2/7	+0.73%	-0.47%	9/14	+2.07%	+2.55%
3/8	+1.06%	-0.43%	10/15	+3.43%	+2.66%
4/9	+1.01%	-0.31%	11/16	+4.56%	+2.75%
5/10	+0.99%	+0.26%	12/17	+4.59%	+2.26%
6/11	+1.24%	+0.19%	Total Ages Sthool/5-17	+1.66%	+0.95%

The greater annual growth rate in the upper grades as given in Table 2b indicates that either a) the schools are having a greater "holding power" in the later grades and/or b) that there was a lump in the distribution of enrollees early in the period which progressed through the grades as the period progressed. It is seen in Table 2b. that the growth rate in enrollment in the grades of Colorado schools is in general greater than the growth of the corresponding age cohort at the national level. This indicates that in general Colorado enrollment trends do not conform to national trends of the corresponding age cohort. Also, the fact that the compound annual growth rate for total school enrollment in Colorado is nearly double the growth rate for the population of 5-17 year olds for the nation reinforces the statement that Colorado population (and enrollment) trends have been generally more positive and accentuated than those of the nation.

The hypothesis that the schools are having greater "holding power" than they have in the past can be supported by considering the enrollment rates for the nation as a whole. Table 2c. gives enrollment rates for the nation for both public schools, and public and private schools combined for the period 1960-77.

Table 2c. Enrollment in grades K-12 as a percent of the population aged 5-17 for public schools, and public and private schools combined for the United States for the years 1960-77.*

Year	Public School	Public and Private Schools	Year	Public School	Public and Private Schools
1960	82.68	96.13	1969	87.08	97.58
1961	82.70	95.72	1970	87.37	97.65
1962	82.98	96.04	1971	87.97	97.70
1963	83.54	96.64	1972	87.95	97.56
1964	83.61	96.63	1973	88.24	97.76
1965	84.36	96.96	1974	88.43	98.24
1966	84.66	96.86	1975	88.92	98.85
1967	85.09	96.72	1976	88.93	98.96
1968	86.47	97.63	1977	89.14	99.35

*Computed from enrollment data from Projections of Education Statistics to 1986-87, National Center for Education Statistics, and population data from Current Population Reports p-25, No.s. 354, 420, 437, 519 and 721, U.S. Department of Commerce, Bureau of the Census.

Without question at the national level the schools are enrolling a greater and greater percentage of the available school age population. It is very likely that some of this increase is in the upper age brackets.

In the future the Bureau of Census projects that enrollment of 14-17 year olds will increase from 95.4 percent in 1975 to up to 98.7 percent in 2000. Enrollment in school of five and six year olds is projected to increase from 90.1 percent in 1975 to up to 96.1 percent in 2000. Enrollment of 7-13 year olds will remain very nearly at the 99.4 percent level.[12] There is every reason to believe that the situation in Colorado will at least parallel these national trends.

C. Grade level enrollments as a percent of total school enrollment

Table 3 presents grade level enrollments for the years 1961-1978 as a percent of total school enrollment along with the mean grade level enrollment as a percent of total school enrollment. These figures were computed from the entries in Table 2. These figures are presented for two reasons: first it is additional information for the reader that otherwise would not be available. Second, the mean entries at the bottom of the table were used as a part of the procedure to project grade level enrollments (Table 8) from projected total school enrollments (Table 7). The assumption being that the distribution of students across the grade levels in the future will be generally the same as it has been in the past. Other discussion of this procedure is given in the discussion of Table 8.

From the mean entries in Table 3 it can be seen that enrollment in grades one through ten are approximately 7.6 percent to 7.8 percent of total school enrollment. This figure drops at grade eleven to 7.0 percent and to 6.2 percent (a drop of .8 percent at each of these grades from the previous grade), presumably because students reach the mandatory attendance of age sixteen, at about grade ten or eleven. Enrollment in other school programs on the average is slightly less than 3 percent of total school enrollment and enrollment in kindergarten is approximately 7 percent of total school enrollment. The rise and fall in enrollment in "other" programs which was described in the discussion of Table 2 is also visible in Table 3. This fluctuation may artificially inflate the mean enrollment in this category as a percent of total school enrollment. Enrollment in

grades 9-12 as a percent of total school enrollment have been generally increasing over the period 1961-1978. This trend indicates that there is a combination of a) an increase in "holding power" at schools in more recent years especially in grades ten, eleven and twelve, and/or b) that the early part of the period 1961-1978 had a "lump" of enrollment in early grades and this "lump" progressed through the grades as time passed.

TABLE 3 GRADE LEVEL ENROLLMENT AS A PERCENT OF TOTAL SCHOOL ENROLLMENT BY YEAR

YEAR	GRADE LEVEL K	1	2	3	4	5	6	7	8	9	10	11	12	OTHER	TOTAL
61	7.2	9.6	9.2	8.8	8.5	8.2	7.8	7.7	7.7	7.9	6.5	5.1	4.6	1.2	100.0
62	7.6	9.5	8.8	8.7	8.4	8.1	7.8	7.5	7.4	7.5	7.4	5.8	4.4	1.1	100.0
63	7.6	9.3	8.7	8.4	8.3	8.0	7.7	7.6	7.2	7.3	7.1	6.6	5.1	1.2	100.0
64	7.5	9.0	8.6	8.3	8.1	8.0	7.7	7.6	7.3	7.0	7.0	6.5	6.0	1.2	100.0
65	7.6	8.9	8.4	8.2	8.1	7.9	7.8	7.7	7.4	7.3	6.8	6.5	6.0	1.5	100.0
66	7.5	8.9	8.4	8.1	8.1	7.9	7.7	7.8	7.5	7.4	7.1	6.4	5.9	1.2	100.0
67	7.4	8.5	8.2	7.9	7.8	7.8	7.6	7.7	7.6	7.5	7.2	6.6	5.9	2.3	100.0
68	7.1	8.1	8.0	7.9	7.7	7.7	7.7	7.8	7.6	7.5	7.3	6.7	6.1	2.8	100.0
69	7.1	8.0	8.0	8.1	8.1	7.9	7.8	7.9	7.7	7.6	7.5	6.8	6.1	1.6	100.0
70	6.9	7.5	7.4	7.6	7.7	7.8	7.6	7.9	7.3	7.7	7.5	7.0	6.3	3.3	100.0
71	6.3	6.9	7.1	7.2	7.5	7.5	7.6	8.1	7.9	7.9	7.6	7.1	6.4	5.1	100.0
72	6.4	6.5	6.8	7.2	7.4	7.7	7.8	8.3	8.1	7.9	7.9	7.2	6.4	4.4	100.0
73	6.6	6.5	6.4	6.8	7.3	7.4	7.7	8.3	8.3	8.2	8.0	7.4	6.5	4.7	100.0
74	6.8	6.8	6.6	6.6	7.1	7.5	7.7	8.3	8.3	8.4	8.2	7.5	6.7	3.3	100.0
75	7.2	7.2	6.8	6.7	6.7	7.2	7.7	8.1	8.2	8.4	8.4	7.8	6.9	2.7	100.0
76	7.2	7.7	7.3	6.9	6.9	6.9	7.4	8.0	8.1	8.5	8.5	8.0	7.1	1.5	100.0
77	6.6	7.7	7.7	7.3	7.0	7.0	7.0	7.9	8.0	8.3	8.6	8.2	7.4	1.5	100.0
78	6.4	7.2	7.8	7.8	7.5	7.2	7.2	7.2	7.7	8.3	8.4	8.1	7.3	1.8	100.0
MEAN	7.0	7.9	7.7	7.7	7.6	7.6	7.6	7.8	7.8	7.8	7.7	7.0	6.2	2.4	100.0

(-0 ENTRY MEANS THAT THE DATA WERE NOT AVAILABLE.)
(MEANS ARE COMPUTED FROM THE NON-ZERO ENTRIES ONLY.)

D. Grade enrollment as a multiple of enrollment in the next lower grade within the same year.

Table 4 presents the multipliers needed to obtain enrollment in one grade from enrollment in the previous grade within the same year. These entries in practicality give the enrollment in one grade as a percent (decimal equivalent) of enrollment in the previous grade within that year. The means of the entries are given at the bottom of the page. From these means it is evident that grade one enrollment is in general about 14 percent greater than enrollment in kindergarten. In grades three through six enrollments are generally within nearly one percent of the enrollment in the previous grade. Between grades six and seven enrollment jumps on the average about 3 percent. Between grade eleven and twelve grade enrollment drops on the average about eleven percent. The lesser value of these last two figures is most likely attributable to students reaching the mandatory school attendance age and choosing to discontinue school attendance.

TABLE 4. GRADE LEVEL ENROLLMENT AS A MULTIPLE OF ENROLLMENT IN THE NEXT LOWER GRADE LEVEL WITHIN THAT YEAR

YEAR	1/K	2/1	3/2	4/3	5/4	6/5	7/6	8/7	9/8	10/9	11/10	12/11
61	1.347	.955	.953	.966	.969	.949	.990	1.001	1.023	.821	.783	.904
62	1.247	.933	.984	.966	.961	.972	.961	.987	1.005	.987	.789	.758
63	1.218	.936	.966	.986	.962	.973	.981	.942	1.013	.974	.942	.770
64	1.200	.952	.964	.970	.990	.967	.988	.960	.962	.990	.933	.929
65	1.168	.943	.982	.982	.974	.995	.980	.970	.979	.934	.956	.925
66	1.186	.940	.969	.993	.979	.976	1.009	.961	.987	.966	.894	.929
67	1.154	.964	.967	.987	.996	.975	1.015	.983	.982	.966	.917	.886
68	1.138	.979	.995	.978	.990	.998	1.014	.974	.996	.969	.923	.906
69	1.124	1.001	1.006	1.006	.978	.983	1.010	.974	.990	.988	.907	.901
70	1.082	.987	1.030	1.011	1.007	.981	1.033	.989	.986	.971	.937	.899
71	1.095	1.040	1.008	1.037	1.011	1.014	1.057	.975	1.000	.971	.927	.898
72	1.018	1.049	1.054	1.030	1.034	1.017	1.065	.970	.985	.994	.914	.882
73	.981	.920	1.071	1.065	1.024	1.034	1.088	.993	.990	.972	.923	.883
74	.993	.974	1.001	1.066	1.061	1.034	1.071	1.007	1.010	.977	.912	.894
75	1.009	.938	.990	.995	1.075	1.067	1.056	1.010	1.022	1.010	.925	.889
76	1.064	.948	.950	.996	.998	1.077	1.075	1.020	1.043	1.007	.939	.888
77	1.167	.995	.956	.957	.996	.998	1.083	1.059	1.042	1.038	.943	.908
78	1.121	1.075	1.011	.955	.966	.988	1.005	1.075	1.079	1.013	.955	.910
MEAN	1.143	.975	.990	.995	.996	.999	1.026	.992	.998	.966	.912	.887

(-0 ENTRY MEANS THAT THE DATA WERE NOT AVAILABLE.)
(MEANS ARE COMPUTED FROM THE NON-ZERO ENTRIES ONLY.)

E. Grade Enrollments as a Multiple of Enrollment in the Previous Grade the Previous Year

Table 5 gives the multipliers that allow one to compute enrollment in a grade from enrollment in the preceding grade the preceding year. Presumably, the enrollment in a grade will be made up of students from the preceding grade the previous year, minus those students who have moved from the area for whatever reason, plus those students who have moved into the area. Means of the entries are given at the bottom of the table. The product of these means is also entered. From the means one can estimate how many students to expect in a grade if enrollment in the previous grade the previous year is known. This process assumes that the pattern of the past will be relatively constant. Thus, for example, it would generally be expected that 95 percent (.949) of the enrollment in grade ten would be in grade eleven the next year, and 92 percent (.924) of the enrollment in grade eleven would be in grade twelve the next year.

The product of the means in Table 5 is a figure which estimates the number of students enrolling in grade twelve relative to the number of students in kindergarten 12 years previous. Assuming that the overall trend of the past continues, one estimate of enrollment in grade twelve would be 1.088 times enrollment in kindergarten twelve years previous. Estimating enrollment in one grade from a previous grade, an appropriate number of years previous, can be made by multiplying corresponding mean multipliers from Table 5. However, the reader should remember that this assumes that the grade to grade pattern of the past will continue, this may or may not be a rash assumption. This procedure could be used to project grade enrollments in the future based on known enrollments in kindergarten, or

known enrollments in other grades. The use of this procedure for projecting future enrollment uses past trends in population in-migration and other such factors only in the sense that these would be "built on" the grade to grade multiples used. This procedure does not make use of computable relationships between population, live births, live birth rates, grade level enrollments and/or total school enrollments that can be established from past trends. Nor does it use these relationships along with some relatively carefully produced population trends for the future. It is, however, likely that due to these factors and the nature of using these "cohort survival multipliers" that in the short term such procedures could be quite accurate, but due to the increased uncertainties over lengthy periods of time a more sophisticated procedure (such as that used in this study) would likely yield more accurate results in longer term projections.

TABLE 5. GRADE LEVEL ENROLLMENT AS A MULTIPLE OF THE ENROLLMENT IN THE PREVIOUS GRADE IN THE PREVIOUS YEAR

YEAR	K / 1	1 / 2	2 / 3	3 / 4	4 / 5	5 / 6	6 / 7	7 / 8	8 / 9	9 / 10	10 / 11	11 / 12
61/62	1.394	.966	.995	1.008	1.003	1.006	1.018	1.016	1.020	.984	.946	.916
62/63	1.283	.963	.997	.999	.995	1.008	1.017	.997	1.024	.992	.946	.923
63/64	1.230	.962	.991	.995	.999	1.003	1.019	.997	1.018	.994	.953	.940
64/65	1.204	.946	.976	.993	.998	1.003	1.017	.998	1.018	.989	.955	.947
65/66	1.204	.969	.995	1.006	1.003	1.006	1.020	.999	1.017	1.004	.961	.934
66/67	1.158	.941	.968	.986	.989	.984	1.023	.997	1.019	.997	.946	.937
67/68	1.133	.961	.992	1.003	1.007	1.009	1.050	1.007	1.020	1.006	.961	.950
68/69	1.147	1.010	1.038	1.049	1.049	1.041	1.054	1.012	1.029	1.020	.956	.933
69/70	1.080	.948	.976	.980	.982	.985	1.035	1.013	1.026	1.006	.955	.946
70/71	1.013	.975	.995	1.002	1.001	1.009	1.086	1.025	1.036	1.020	.974	.934
71/72	1.060	1.015	1.028	1.051	1.047	1.053	1.106	1.015	1.026	1.020	.960	.913
72/73	1.012	.974	.994	1.004	.998	.999	1.068	.996	1.016	1.003	.932	.900
73/74	1.017	1.010	1.031	1.027	1.023	1.033	1.070	.991	1.008	.995	.934	.904
74/75	1.060	1.001	1.017	1.011	1.020	1.026	1.048	.989	1.004	1.003	.950	.926
75/76	1.067	1.003	1.015	1.022	1.025	1.027	1.035	1.000	1.032	1.016	.945	.907
76/77	1.061	.992	1.000	1.007	1.007	1.006	1.012	.996	1.018	1.011	.947	.916
77/78	1.084	.998	1.014	1.014	1.023	1.015	1.022	1.015	1.034	1.005	.926	.894
MEAN	1.147	.979	1.002	1.010	1.010	1.013	1.040	1.004	1.022	1.002	.949	.924

PRODUCT OF THE MEANS IS 1.088

(-0 ENTRY MEANS THAT THE DATA WERE NOT AVAILABLE.)
(MEANS ARE COMPUTED FROM THE NON-ZERO ENTRIES ONLY.)

F. Colorado Population Projections

Table 6 presents the population projections for 1980-2000 as given by the Colorado Department of Local Affairs Division of Planning.[13] These projections are given at two levels, a low projection and a high projection. The low and high projections correspond to a fifty percent confidence interval for the projection. This means that there is a fifty-fifty chance that the actual population will fall between the low and high figures. There is very good reason to believe that the low projection is precisely that, a low projection. The reason for this belief is the fact that the 1979 low projected population of 2,618,100 (1979 figures are not entered in Tables 6-10) is lower (by 1.7 percent) than the estimated actual population for 1978 (2,664,000). For this reason it is felt by this researcher that a figure about halfway between the low and high projections (in each of Table 6-10) is a more reasonable figure than the low projection figure.

Adjacent to the projected population is the percent change from the previous year. At the bottom of the Table is the mean percent change over the years 1980-1990. From these figures it is projected that the average annual growth in population (1980-1990) for the state of Colorado will be in between 1.3 percent and 2.0 percent annual increase. If one compares the compound annual growth rate in Colorado over 1980-2000 as projected it will be between 1.53 percent and 1.99 percent annually.

If one considers that the U.S. Department of Commerce projects that from 1975 to 2000 the rate of enrollment in institutions of higher education

will increase from 31.6 percent to 38.9 percent for persons aged 18-24, from 8.2 percent to 11.4 percent for persons aged 25-29 and from 4.6 percent to a minimum of 6.8 percent for persons aged 30-34.[14] The projected increases in population in Colorado could and likely will have profound effect on enrollment in higher education in Colorado over the next 20 years.

Comparison with National, and Denver Area Figures

This State of Colorado projected growth rate can be placed in perspective by considering projections of population for the Denver metropolitan area as given by the U.S. Department of Housing and Urban Development.[15] The Denver metropolitan area is projected to grow at an annual growth rate of from 1.8 to 2.3 percent during the period 1980-2000. The U.S. Bureau of Census[16] projects that the population of the nation will grow at an annual rate of just under one percent during the period 1980-2000. A slightly greater growth rate for Colorado for 1980-2000 is projected by the Bureau of the Census to be in the neighborhood of 1.3 percent.[17] The greater growth rate for Colorado and the Denver metropolitan area than that of the nation as a whole is consistent with the fact that Colorado is felt by many persons to be a very desireable place to live and the fact that Colorado is expected to be a major center of energy development.

C. Projected Live Births

Projected live births for the years 1980-2000 are presented in Table 6 for both low and high projections. These projections are computed from the projected population using the regression equation given in Appendix A. This regression equation was computed using a multiple regression procedure as described in the methodology section of this report. Adjacent to the projected live births is a calculated percent change from the previous year. The mean percent annual change in the projected live births for 1980-1990 is given at the bottom of the Table. It is seen that the mean percent yearly change is.2 percent for the low projection, .4 percent for the high projection. The fact that these two means are not as great as the mean percent yearly change for projected population means that live births are expected to increase but not as rapidly as the population. The projected .2 to .4 percent annual growth rate in live births is less than that projected for the nation as a whole. Live births for the nation as a whole are projected to increase at an annual rate of between .5 and .9 percent annually.[18]

H. Projected Live Birth Rate

Projected live birth rate was calculated from the projected population and projected live births. This calculation was made for both the low and high projections and for the years 1980-2000. It can be seen that the live birth rate is expected to decrease on the average of between 1.1 percent to 1.6 percent per year. There is reason to believe, however, that this trend of decreasing live birth rate will descend to a minimum. The minimum live birth rate was 15.5 in 1975. Thus a reasonable minimum could be around 15 live births per 1000 population in the 1980-2000 period. Secondly, for the nation as a whole the projected live birth rate (compared) decreases from 17.3 to 14.4 from 1980 to 2000.[19] There is little reason to believe the Colorado live birth rate will differ significantly from the national rate. Third, a report from the National Institute of Education[20] indicates that the live birth rate is expected to increase.

The projected, and purely theoretical, continued decline in the Colorado live birth rate over the period 1980-2000 as shown in Table 6 is the result of the assumption inherent in the analysis procedure that trends from the base period will continue through the period of projection. This assumption does not account for reasonable minimum values of certain variables such as in this case the live birth rate. However, there was no acceptable rationale correcting this difficulty. Thus it is recognized that the projected live birth rate as given in Table 6 will in fact underestimate actual figures. The result of this underestimate will be that live births will be underestimated and in addition school enrollments,

grade enrollments, and numbers of teachers and other certified personnel which are partially a factor of live births and are dealt with in subsequent sections of this report will also be underestimated. The precise magnitude of this underestimate cannot be established so to continue the conservative nature of projections contained in this report they are left unadjusted.

If one carefully reads the figures in Table 6 it can be seen that a) for each year the projected live birth rate is greater for the low projection than the high projections; and b) the difference between the low and high projected live birth rate gets greater as the years progress. This phenomena is caused by the differential rates of increase for projected population and projected live births. That is, even though live births are projected to increase the rate of increase is less than that projected for population. This differential rate of growth causes the anomaly in the projected live birth rate since projected live birth rate is computed directly from projected population and projected live births using the formula:

$$\text{live birth rate} = \frac{\text{live births}}{\text{population}} \times 1000.$$

TABLE 6. LOW AND HIGH PROJECTIONS FOR POPULATION, LIVE BIRTHS AND LIVE BIRTH RATE BY YEAR

YEAR		PROJECTED POPULATION	PERCENT CHANGE FROM PREVIOUS YEAR	PROJECTED LIVE BIRTHS	PERCENT CHANGE FROM PREVIOUS YEAR	PROJECTED LIVE BIRTH RATE	PERCENT CHANGE FROM PREVIOUS YEAR
1980	LOW	2623100.		41039.		15.6	
	HIGH	2905400.		41776.		14.4	
1981	LOW	2655000.	1.224	41123.	.204	15.5	-1.007
	HIGH	2970300.	2.244	41946.	.407	14.1	-1.796
1982	LOW	2687700.	1.224	41207.	.206	15.3	-1.005
	HIGH	3035700.	2.225	42119.	.411	13.9	-1.774
1983	LOW	2721800.	1.258	41296.	.214	15.2	-1.030
	HIGH	3103700.	2.206	42293.	.415	13.6	-1.752
1984	LOW	2754700.	1.220	41382.	.210	15.0	-.998
	HIGH	3158600.	1.769	42437.	.339	13.4	-1.405
1985	LOW	2787700.	1.198	41469.	.208	14.9	-.978
	HIGH	3215400.	1.798	42585.	.349	13.2	-1.423
1986	LOW	2820500.	1.392	41570.	.244	14.7	-1.132
	HIGH	3277600.	1.934	42747.	.361	13.0	-1.524
1987	LOW	2867000.	1.433	41676.	.254	14.5	-1.162
	HIGH	3341900.	1.962	42915.	.393	12.8	-1.539
1988	LOW	2907700.	1.420	41782.	.255	14.4	-1.148
	HIGH	3406800.	1.942	43085.	.395	12.6	-1.518
1989	LOW	2951000.	1.489	41895.	.271	14.2	-1.201
	HIGH	3472200.	1.920	43255.	.396	12.5	-1.495
1990	LOW	2997900.	1.589	42017.	.292	14.0	-1.277
	HIGH	3535500.	1.823	43421.	.382	12.3	-1.415
1995	LOW	3242100.	8.146	42655.	1.517	13.2	-6.129
	HIGH	3880100.	9.747	44320.	2.072	11.4	-6.993
2000	LOW	3500200.	7.961	43329.	1.560	12.4	-5.911
	HIGH	4224500.	8.876	45219.	2.029	10.7	-6.289
MEAN (1981-1990)	LOW		1.345		.236		-1.094
	HIGH		1.982		.387		-1.564

I. Projected Total School Enrollments

Table 7 presents both low and high projected total school enrollments for the years 1980-2000. Each of these total school enrollment projections was obtained from an equation relating grade level enrollments to population in the year of enrollment, live births the year the students in that grade would have been born and population during the year of birth. This number was then adjusted for enrollment in non-graded, special education and other such classes to arrive at the total school enrollment. The equation for total school enrollment (without adjustment) is given in Appendix A.

When the above procedure was applied to projecting school enrollment for the year 1978 the result was an error in projection from the actual enrollment of nine-tenths of one percent. (Projected enrollment for 1978 was 563,519 whereas the actual enrollment was 558,285). Four other projection procedures tested within this study resulted in errors greater than nine-tenths of one percent for 1978.

The percent change in projected total school enrollment from year to year is also entered in Table 7. The mean percent change is given at the bottom of the Table. Total school enrollment is expected to annually increase an average of between 1.2 percent and 1.8 percent over the period 1980-1990. This average annual increase for this period is slightly less than the average annual increase in projected population over the same period. It is expected that in the mid-1980's there will be a period of little or no increase in enrollment. The percent increase in enrollment from 1978 to 2000 is expected to be between 26 percent (558,285 to 703,103 for the low projection) and 49 percent (558,285 to 829,724 for the high projection).

TABLE 7. PROJECTED TOTAL SCHOOL ENROLLMENT BASED ON THE LOW AND HIGH POPULATION PROJECTIONS FROM TABLE 6.

YEAR		PROJECTED POPULATION	PERCENT CHANGE FROM PREVIOUS YEAR		PROJECTED TOTAL SCHOOL ENROLLMENT	PERCENT CHANGE FROM PREVIOUS YEAR
1980	LOW	2623100.		LOW	546951.	
	HIGH	2905400.		HIGH	609601.	
1981	LOW	2655200.	1.224	LOW	551500.	.850
	HIGH	2970600.	2.244	HIGH	621596.	1.968
1982	LOW	2687700.	1.224	LOW	566061.	2.622
	HIGH	3036700.	2.225	HIGH	643514.	3.526
1983	LOW	2721500.	1.258	LOW	581159.	2.667
	HIGH	3103700.	2.206	HIGH	665980.	3.491
1984	LOW	2754700.	1.220	LOW	592616.	1.971
	HIGH	3158600.	1.769	HIGH	679764.	2.070
1985	LOW	2787700.	1.198	LOW	595851.	.546
	HIGH	3215400.	1.798	HIGH	686357.	.970
1986	LOW	2826500.	1.392	LOW	594420.	-.240
	HIGH	3277600.	1.934	HIGH	690823.	.651
1987	LOW	2867000.	1.433	LOW	593247.	-.197
	HIGH	3341900.	1.962	HIGH	692656.	.265
1988	LOW	2907700.	1.420	LOW	601253.	1.350
	HIGH	3406800.	1.942	HIGH	701167.	1.229
1989	LOW	2951000.	1.489	LOW	612529.	1.875
	HIGH	3472200.	1.920	HIGH	714424.	1.891
1990	LOW	2997900.	1.589	LOW	619508.	.976
	HIGH	3536500.	1.823	HIGH	732723.	2.561
1995	LOW	3242100.	8.146	LOW	653714.	5.692
	HIGH	3880100.	9.747	HIGH	774021.	5.636
2000	LOW	3500200.	7.961	LOW	703103.	7.555
	HIGH	4224500.	8.876	HIGH	829724.	7.197
MEAN (1981-1990)			LOW 1.345 HIGH 1.982			LOW 1.242 HIGH 1.862

PROJECTED TOTAL SCHOOL ENROLLMENT WAS OBTAINED BY SUMMING THIRTEEN INDIVIDUAL GRADE LEVEL PROJECTION EQUATIONS EACH ONE USING THREE INDEPENDENT VARIABLES, POPULATION, LIVE BIRTHS AND GRADE LEVEL ENROLLMENTS FOR THE YEARS 1960 THROUGH 1978.

Overall school enrollment is expected to increase from one to three percent annually in the early 1980's. In the mid 1980's there will be a period of little or no growth in total school enrollments and then in the late 1980's and 1990's the growth is projected to be in the range of 1.2 to two percent annually. It should be noted, however, that total school enrollment is not expected to grow as rapidly as the population over the period 1980-2000. It should also be noted that growth in enrollment for the state as a whole is expected to be slightly less than the Denver metropolitan area[21] but greater than the nation.[22]

Comparison with National Figures

The reasonableness of the total school projections can be checked by comparing projected total school enrollment as a percent of projected population for Colorado and the nation as a whole.

Table 7a. Projected public school enrollment as a percent of projected population.

	United States[23]	Low Colorado	High Colorado
1980	18.58	20.85	20.98
1985	21.25	21.37	21.35
1990	21.57	20.63	20.72
1995	18.43	20.16	19.95
2000	18.07	20.09	19.64

The figures in Table 7a. indicate that the initial projections of public school enrollments as a percent of population for Colorado are slightly higher than that of the nation as a whole except for the years 1985 and 1990. This situation has been representative of the situation in Colorado with respect to the nation for all of the period 1961-1977 (Table 2a.) and at about the same level as given in Table 7a. Thus the projected school enrollments given in this report are reasonable when compared to the population projections for both Colorado and the nation and expected enrollment rates for the nation.

J. Grade Level Projections

Low and high grade level projections for the years 1980-2000 are given in Table 8. The entries in this table are computed by multiplying the total school enrollment from Table 7 by the mean grade level enrollment as a percent of total school enrollment from Table 3. The individual grade level equations for this table are given in Appendix A. The reader should be cautioned that these grade level projections will not be as accurate as the total school enrollment projections given in Table 7. It is expected that this procedure will slightly overestimate enrollments in grades K-8, underestimate enrollments in grades 9-12, and overestimate enrollment in the "other" category, at least for the near future. The reason for this is that for grades K-8 the mean grade enrollment as a percent of total school enrollment is slightly greater than the actual figures during recent years. Likewise, for grades 9-12, enrollment as a percent of total school enrollment has been increasing over the period 1960-1978. Thus the mean of these figures will underestimate actual enrollment. For enrollment in the "other" category mean enrollment as a percent of total school enrollment is inflated because the "bulge" period of 1967 to 1976 artificially inflates the mean implying that the projections for the "other" categary will be overestimates.

Thus, the use of the mean grade level enrollment as a percent of total school enrollment has a tendency to correct for a possible artificial inflation of upper grade enrollments caused by the "lump" of enrollment discussed relative to Tables 2 and 3.

Grade twelve enrollments are projected to increase, at the lower bound, from 3000 to 10,000 between 1978 and 2000. This indicates a significant increase in the pool of high school graduates which could seek enrollment in Colorado institutions of higher education.

Comparison with Population and National Figures

One method of checking on the reasonableness of the grade twelve projections is to compare them to the projected state population and then compare this figure with corresponding figures for the nation as a whole. Thus the reader is directed to Table 8a!

Table 8a. Comparison of public school twelfth grade enrollment as a percent of projected population for the nation and for Colorado

	United States*	Low Colorado	High Colorado
1980	1.47	1.29	1.30
1985	1.21	1.32	1.32
1990	1.08	1.27	1.28
1995	1.18	1.25	1.23
2000	1.33	1.24	1.21

*Twelfth grade enrollment for the nation was estimated from projected enrollment rates for 17 year olds projected 17 year old population, and public school enrollment as a percent of total school enrollment.

Table 8a. indicates that overall the Colorado Public School projected grade 12 enrollment as a percent of population is equal to or less than corresponding national figures except for the years 1990 and 1995. For these two years in the Table it should be kept in mind that over the past several years Colorado population has been slightly younger than that of the nation as a whole. This indicates that it is reasonable to expect the Colorado grade 12 age group to comprise a greater percentage of the population than for the nation as a whole. Thus the figures in Table 8a. as a measure of reasonableness of the grade 12 projections in Table 8 indicate that they are reasonable when compared to projected national figures.

TABLE 8. PROJECTED GRADE LEVEL ENROLLMENTS COMPUTED BY MULTIPLYING THE PROJECTED TOTAL SCHOOL ENROLLMENT FROM TABLE 7 BY THE MEAN ENROLLMENT IN EACH GRADE AS A PERCENT OF TOTAL SCHOOL ENROLLMENT FROM TABLE 3.

YEAR		GRADE LEVEL K	1	2	3	4	5	6	7	8	9	10	11	12	OTHER	TOTAL
1980	LOW	38631.	43715.	42591.	42150.	41945.	41809.	41747.	42839.	42467.	42764.	41652.	38062.	33791.	12861.	546951.
	HIGH	43056.	48722.	47459.	46978.	46749.	46596.	46529.	47748.	47332.	47595.	46423.	42422.	37661.	14334.	609601.
1981	LOW	38959.	44086.	42943.	42508.	42301.	42163.	42102.	43203.	42828.	43067.	42006.	38386.	34078.	12970.	551600.
	HIGH	43903.	49681.	48392.	47902.	47669.	47513.	47444.	48685.	48263.	48532.	47336.	43257.	38402.	14616.	621596.
1982	LOW	39981.	45242.	44069.	43623.	43410.	43268.	43205.	44336.	43951.	44196.	43107.	39392.	34971.	13310.	566061.
	HIGH	45451.	51432.	50099.	49591.	49350.	49189.	49117.	50402.	49965.	50243.	49005.	44782.	39756.	15132.	643514.
1983	LOW	41047.	46449.	45244.	44786.	44568.	44422.	44358.	45518.	45123.	45375.	44257.	40443.	35904.	13665.	581159.
	HIGH	47038.	53228.	51848.	51323.	51073.	50906.	50832.	52161.	51709.	51997.	50716.	46345.	41144.	15660.	665980.
1984	LOW	41856.	47364.	46136.	45669.	45447.	45298.	45232.	46415.	46013.	46269.	45129.	41240.	36612.	13935.	592616.
	HIGH	48012.	54330.	52921.	52385.	52130.	51959.	51884.	53241.	52779.	53073.	51766.	47305.	41996.	15984.	679764.
1985	LOW	42085.	47623.	46388.	45918.	45695.	45545.	45479.	46669.	46264.	46522.	45375.	41465.	36812.	14011.	595851.
	HIGH	48277.	54657.	53434.	52893.	52635.	52463.	52387.	53757.	53291.	53588.	52268.	47763.	42403.	16139.	686357.
1986	LOW	41984.	47509.	46277.	45808.	45585.	45436.	45370.	46557.	46153.	46410.	45266.	41366.	36723.	13977.	594420.
	HIGH	48153.	55213.	53782.	53237.	52978.	52805.	52728.	54107.	53638.	53937.	52608.	48074.	42679.	16244.	690823.
1987	LOW	41901.	47415.	46185.	45718.	45495.	45346.	45280.	46465.	46062.	46318.	45177.	41284.	36651.	13950.	593247.
	HIGH	48022.	55360.	53925.	53379.	53119.	52945.	52868.	54251.	53780.	54080.	52747.	48202.	42792.	16287.	692656.
1988	LOW	42466.	48055.	46809.	46335.	46109.	45956.	45891.	47092.	46683.	46943.	45787.	41841.	37145.	14138.	601253.
	HIGH	49523.	56040.	54587.	54034.	53771.	53595.	53518.	54917.	54441.	54744.	53395.	48794.	43318.	16487.	701167.
1989	LOW	43263.	48956.	47696.	47204.	46974.	46820.	46752.	47975.	47559.	47824.	46645.	42626.	37842.	14403.	612529.
	HIGH	50460.	57100.	55619.	55056.	54786.	54609.	54529.	55956.	55470.	55779.	54405.	49717.	44137.	16799.	714424.
1990	LOW	43685.	49434.	48152.	47664.	47432.	47277.	47208.	48443.	48023.	48291.	47101.	43042.	38211.	14544.	618508.
	HIGH	51752.	58562.	57044.	56466.	56191.	56006.	55926.	57389.	56891.	57208.	55799.	50990.	45268.	17229.	732723.
1995	LOW	46172.	52248.	50893.	50377.	50132.	49968.	49896.	51201.	50757.	51039.	49782.	45492.	40396.	15372.	653714.
	HIGH	54669.	61863.	60259.	59649.	59358.	59164.	59078.	60624.	60098.	60433.	58943.	53864.	47819.	18200.	774021.
2000	LOW	49660.	56195.	54736.	54184.	53920.	53743.	53665.	55069.	54591.	54895.	53543.	48929.	43438.	16533.	703103.
	HIGH	58603.	66315.	64596.	63941.	63630.	63422.	63330.	64986.	64423.	64782.	63185.	57740.	51260.	19510.	829724.

K. Certified Personnel Needs

Table 9 translates the entries in Table 7 into personnel figures. Table 9 gives the number of certified personnel needed to support the enrollment projections given in Table 7. The assumption for this Table is that the ratio of students to certificated personnel will continue to be the same as it was in 1978. (The actual ratio for 1978 was 558,285 students to 34,986 certified personnel). The result is that from 1978 to the year 2000, given the projected school enrollments, 9000 to 17,000 additional certificated personnel will be needed in the state.

TABLE 9. NUMBER OF CERTIFIED PERSONNEL NEEDED TO SUPPORT THE TOTAL SCHOOL ENROLLMENTS PROJECTED IN TABLE 7. (THE RATIO OF STUDENTS TO CERTIFIED PERSONNEL USED WAS THE SAME AS IT WAS FOR THE STATE OF COLORADO FOR 1978, ABOUT 16 TO 1.)

YEAR		PROJECTED TOTAL SCHOOL ENROLLMENT	CERTIFIED PERSONNEL NEEDED	PERCENT CHANGE FROM PREVIOUS YEAR
1980	LOW	546951.	34276.	
	HIGH	609601.	38202.	
1981	LOW	551600.	34567.	.850
	HIGH	621596.	38954.	1.968
1982	LOW	566061.	35473.	2.622
	HIGH	643514.	40327.	3.526
1983	LOW	581159.	36419.	2.667
	HIGH	665980.	41735.	3.491
1984	LOW	592616.	37137.	1.971
	HIGH	679764.	42595.	2.070
1985	LOW	595351.	37340.	.546
	HIGH	686357.	43012.	.970
1986	LOW	594420.	37250.	-.240
	HIGH	690823.	43292.	.651
1987	LOW	593247.	37177.	-.197
	HIGH	692656.	43407.	.265
1988	LOW	601253.	37679.	1.350
	HIGH	701167.	43940.	1.229
1989	LOW	612529.	38385.	1.875
	HIGH	714424.	44771.	1.891
1990	LOW	618508.	38760.	.976
	HIGH	732723.	45917.	2.561
1995	LOW	653714.	40966.	5.692
	HIGH	774021.	48506.	5.636
2000	LOW	703103.	44061.	7.555
	HIGH	829724.	51996.	7.197

L. Teacher Needs

Table 10 translates the grade level projections in Table 8 into the number of teachers needed to support the projected grade level enrollments. The ratio of students to teachers used was the same as it was in 1978. (The actual ratio for 1978 was 558,285 students to 29,464 teachers). This means that from 1978 to the year 2000 there will be a need for from 7500 to 14,000 additional teachers in the state.

The figures contained in Tables 9 and 10 are important for the future of education in Colorado. These Tables represent a significant increase in the demand for teachers and other certified school personnel, an increase over 1978 of up to 14,400 additional teachers and 2700 non-teacher certified personnel. There are other facts that impinge on the need for additional certified school personnel in Colorado.

a) Each year there are about 2000 vacancies which become available due to "turnover;"

b) For the recent past about 44 percent of teaching positions in Colorado have been filled by hiring persons from outside Colorado;[25]

c) Only 60-75 percent of Colorado teacher education graduates actively seek a teaching position;[26]

d) It is expected by the Colorado Commission on Higher Education that the number of Colorado teacher education graduates will continue to decrease in the near future; and

e) Approximately 15 percent of Colorado teacher education graduates obtain positions in other states.[27]

f) There is a lag of at least four to five years between action to increase college enrollments in certain fields and the graduation of students from that program.

These facts indicate that a slight increase in state resources allocated to educating school personnel may be needed over the next few years.

TABLE 10. NUMBER OF CLASSROOM TEACHERS NEEDED TO SUPPORT THE GRADE LEVEL PROJECTIONS GIVEN IN TABLE 8.

YEAR		GRADE LEVEL K	1	2	3	4	5	6	7	8	9	10	11	12	OTHER	TOTAL
1980	LOW	2039.	2307.	2247.	2225.	2214.	2206.	2203.	2281.	2241.	2254.	2198.	2009.	1783.	679.	28866.
	HIGH	2272.	2571.	2505.	2479.	2467.	2459.	2456.	2520.	2498.	2512.	2450.	2239.	1988.	757.	32172.
1981	LOW	2056.	2327.	2268.	2243.	2232.	2225.	2222.	2280.	2260.	2273.	2217.	2026.	1798.	685.	29111.
	HIGH	2317.	2622.	2554.	2528.	2516.	2506.	2504.	2569.	2547.	2561.	2498.	2283.	2027.	771.	32805.
1982	LOW	2110.	2382.	2326.	2302.	2291.	2284.	2280.	2340.	2320.	2332.	2275.	2079.	1846.	702.	29874.
	HIGH	2389.	2714.	2644.	2617.	2604.	2595.	2592.	2660.	2637.	2652.	2586.	2363.	2098.	799.	33962.
1983	LOW	2166.	2451.	2388.	2364.	2352.	2344.	2341.	2402.	2381.	2395.	2336.	2134.	1895.	721.	30671.
	HIGH	2462.	2809.	2738.	2709.	2695.	2687.	2683.	2753.	2729.	2744.	2677.	2446.	2171.	826.	35148.
1984	LOW	2209.	2500.	2435.	2410.	2398.	2391.	2387.	2450.	2428.	2442.	2382.	2176.	1932.	735.	31276.
	HIGH	2534.	2867.	2793.	2765.	2751.	2742.	2738.	2810.	2785.	2801.	2732.	2497.	2216.	844.	35875.
1985	LOW	2221.	2513.	2448.	2423.	2412.	2404.	2400.	2463.	2442.	2455.	2395.	2188.	1943.	739.	31447.
	HIGH	2550.	2885.	2810.	2781.	2768.	2759.	2755.	2827.	2812.	2828.	2758.	2521.	2238.	852.	36223.
1986	LOW	2216.	2507.	2442.	2418.	2406.	2398.	2394	2457.	2436.	2449.	2389.	2183.	1938.	738.	31371.
	HIGH	2575.	2914.	2838.	2810.	2796.	2787.	2783.	2856.	2831.	2847.	2776.	2537.	2252.	857.	36459.
1987	LOW	2211.	2502.	2437.	2413.	2401.	2393.	2390.	2452.	2431.	2444.	2384.	2179.	1934.	736.	31309.
	HIGH	2582.	2922.	2846.	2817.	2803.	2794.	2790.	2863.	2838.	2854.	2784.	2544.	2258.	860.	36556.
1988	LOW	2241.	2535.	2470.	2445.	2433.	2425.	2422.	2485.	2464.	2477.	2416.	2208.	1960.	746.	31732.
	HIGH	2614.	2958.	2881.	2852.	2838.	2829.	2824.	2898.	2873.	2889.	2818.	2575.	2286.	870.	37005.
1989	LOW	2283.	2584.	2517.	2491.	2479.	2471.	2467.	2532.	2510.	2524.	2462.	2250.	1997.	760.	32327.
	HIGH	2663.	3013.	2935.	2906.	2891.	2882.	2878.	2953.	2927.	2944.	2871.	2624.	2329.	887.	37704.
1990	LOW	2306.	2609.	2541.	2515.	2503.	2495.	2491.	2557.	2534.	2549.	2486.	2272.	2017.	768.	32642.
	HIGH	2731.	3091.	3011.	2980.	2965.	2956.	2952.	3029.	3002.	3019.	2945.	2691.	2389.	909.	38670.
1995	LOW	2437.	2757.	2686.	2659.	2646.	2637.	2633.	2702.	2679.	2694.	2627.	2401.	2131.	811.	34500.
	HIGH	2885.	3265.	3180.	3148.	3133.	3122.	3118.	3199.	3172.	3189.	3111.	2843.	2524.	961.	40850.
2000	LOW	2621.	2966.	2889.	2860.	2846.	2836.	2832.	2906.	2881.	2897.	2826.	2582.	2292.	873.	37107.
	HIGH	3003.	3400.	3409.	3275.	3358.	3347.	3342.	3430.	3400.	3419.	3335.	3047.	2705.	1030.	43789.

THE STUDENT TO TEACHER RATIO USED WAS THE SAME AS IT WAS IN THE STATE OF COLORADO IN 1978, ABOUT 19 TO 1.

IV. Executive Summary

The purpose of this study was to project school enrollments for the state of Colorado for the period 1980-2000. The previous sections of this report have presented the procedures used in the study and given the results based on these procedures. Based on these results the following conclusions can be made.

1. With increasing population the pool of potential adult enrollees in Colorado institutions of higher education will increase beyond the increase in grade twelve enrollees cited in #10 below.

2. The number of live births annually in Colorado will decrease slightly from the 44,063 in 1978 over the beginning of the period 1980-2000 and then return to a level slightly greater than that in 1978 near the end of this period.

3. The overall rate of growth in live births in Colorado for the period 1980-2000 will be slightly greater than 0.3 percent annually.

4. It is likely that the live birth rate will not decrease significantly below 14 births per 1000 population per year. Given this probability, actual live births over the next twenty years should be significantly greater than those projected in this study.

5. The result of this projected increase in live births cited in #4 above would be a proportionate increase in school enrollments, certificated personnel needs, and teacher needs in excess of those projected in this study.

6. Total school enrollment in Colorado will generally increase over the period 1980-2000 with an average annual percent increase of between

1.2 and 1.9 percent. This growth rate will be slightly less than the growth rate for population over the same period.

7. During the mid-1980's there will be a period of two-to-three years of little of no growth in total school enrollment in Colorado.

8. It is expected that grade level enrollment trends will generally parallel the trend in total school enrollment.

9. It is expected that grade level enrollments, number of certificated personnel, and number of teachers will closely parallel the trend in total school enrollment over the period 1980-2000.

10. The pool of grade twelve enrollees will gradually increase from 1978 to 2000 in the range of at least 3000 to 10,000 indicating gradually increasing enrollments in Colorado institutions of higher education.

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APPENDIX A

TECHNICAL INFORMATION

FORMULA FOR LIVE BIRTH PROJECTIONS GIVEN IN TABLE 6.

LIVE BIRTHS = (.00201058) POPULATION + (34191.)

R SQUARED = .08066 F = 1.57934 SIGNIFICANCE = .225 N = 20

TOTAL SCHOOL ENROLLMENT = (.2167089) POPULATION DURING THE YEAR OF ENROLLMENT

+(.3940530) LIVE BIRTHS 5 YEARS PRIOR TO THE YEAR OF ENROLLMENT

+(.8894012) LIVE BIRTHS 6 YEARS PRIOR TO THE YEAR OF ENROLLMENT

+(.7202831) LIVE BIRTHS 7 YEARS PRIOR TO THE YEAR OF ENROLLMENT

+(.9483052) LIVE BIRTHS 8 YEARS PRIOR TO THE YEAR OF ENROLLMENT

+(.7670248) LIVE BIRTHS 9 YEARS PRIOR TO THE YEAR OF ENROLLMENT

+(.7227302) LIVE BIRTHS 10 YEARS PRIOR TO THE YEAR OF ENROLLMENT

+(.5116183) LIVE BIRTHS 11 YEARS PRIOR TO THE YEAR OF ENROLLMENT

+(.9967842) LIVE BIRTHS 12 YEARS PRIOR TO THE YEAR OF ENROLLMENT

+(.7734387) LIVE BIRTHS 13 YEARS PRIOR TO THE YEAR OF ENROLLMENT

+(.6747569) LIVE BIRTHS 14 YEARS PRIOR TO THE YEAR OF ENROLLMENT

+(.6065581) LIVE BIRTHS 15 YEARS PRIOR TO THE YEAR OF ENROLLMENT

+(.6724199) LIVE BIRTHS 16 YEARS PRIOR TO THE YEAR OF ENROLLMENT

+(-1.5524865) LIVE BIRTHS 17 YEARS PRIOR TO THE YEAR OF ENROLLMENT

+(-.0143783) POPULATION 5 YEARS PRIOR TO THE YEAR OF ENROLLMENT
+(-.0052918) POPULATION 6 YEARS PRIOR TO THE YEAR OF ENROLLMENT
+(.0059617) POPULATION 7 YEARS PRIOR TO THE YEAR OF ENROLLMENT
+(-.0159993) POPULATION 8 YEARS PRIOR TO THE YEAR OF ENROLLMENT
+(-.0190983) POPULATION 9 YEARS PRIOR TO THE YEAR OF ENROLLMENT
+(-.0050095) POPULATION 10 YEARS PRIOR TO THE YEAR OF ENROLLMENT
+(.0532342) POPULATION 11 YEARS PRIOR TO THE YEAR OF ENROLLMENT
+(-.0049084) POPULATION 12 YEARS PRIOR TO THE YEAR OF ENROLLMENT
+(-.0247867) POPULATION 13 YEARS PRIOR TO THE YEAR OF ENROLLMENT
+(-.0165660) POPULATION 14 YEARS PRIOR TO THE YEAR OF ENROLLMENT
+(-.0181702) POPULATION 15 YEARS PRIOR TO THE YEAR OF ENROLLMENT
+(-.0265351) POPULATION 16 YEARS PRIOR TO THE YEAR OF ENROLLMENT
+(0) POPULATION 17 YEARS PRIOR TO THE YEAR OF ENROLLMENT
+(-114121.)

FORMULAS FOR THE GRADE LEVEL ENROLLMENT PROJECTIONS GIVEN IN TABLE 8.

ENROLLMENT IN KINDERGARTEN = (.0706298)TOTAL SCHOOL ENROLLMENT FROM TABLE 7.

ENROLLMENT IN GRADE 1 = (.0799242)TOTAL SCHOOL ENROLLMENT FROM TABLE 7.

ENROLLMENT IN GRADE 2 = (.0776518)TOTAL SCHOOL ENROLLMENT FROM TABLE 7.

ENROLLMENT IN GRADE 3 = (.0770635)TOTAL SCHOOL ENROLLMENT FROM TABLE 7.

ENROLLMENT IN GRADE 4 = (.0766682)TOTAL SCHOOL ENROLLMENT FROM TABLE 7.

ENROLLMENT IN GRADE 5 = (.0764375)TOTAL SCHOOL ENROLLMENT FROM TABLE 7.

ENROLLMENT IN GRADE 6 = (.0763263)TOTAL SCHOOL ENROLLMENT FROM TABLE 7.

ENROLLMENT IN GRADE 7 = (.0763229)TOTAL SCHOOL ENROLLMENT FROM TABLE 7.

ENROLLMENT IN GRADE 8 = (.0776435)TOTAL SCHOOL ENROLLMENT FROM TABLE 7.

ENROLLMENT IN GRADE 9 = (.0760760)TOTAL SCHOOL ENROLLMENT FROM TABLE 7.

ENROLLMENT IN GRADE 10 = (.0761522)TOTAL SCHOOL ENROLLMENT FROM TABLE 7.

ENROLLMENT IN GRADE 11 = (.0695893)TOTAL SCHOOL ENROLLMENT FROM TABLE 7.

ENROLLMENT IN GRADE 12 = (.0617799)TOTAL SCHOOL ENROLLMENT FROM TABLE 7.

ENROLLMENT IN OTHER PROGRAMS = (.0235142)TOTAL SCHOOL ENROLLMENT FROM TABLE 7.